

OCEA 4110/5110 EARTH 4110: Geological Oceanography Syllabus Winter 2025

January 2025

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people. Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Welcome

This course provides a survey of geology and geophysics as they apply to the oceans. The course covers methods, observations and quantitative applications used in marine geology, geophysics and paleoceanography. Topics include the origin of ocean basins, isostasy, plate tectonics, gravity, and magnetism; patterns and processes of sediment transport and deposition, and the paleoceanographic reconstruction of past climates.

Prerequisites: OCEA 2001, OCEA 2002, EARTH 1080, OCEA 2021, OCEA 2022

Lectures: Wednesdays and Fridays, 8:35 - 9:55 am
LSC-Oceanography 3655

Delivery: in-person (no recordings)

Instructors

Dr. Stephanie Kienast (primary instructor)
stephanie.kienast@dal.ca
room 5616, Life Science Center, Oceanography Wing

Dr. Markus Kienast
Feb 28- March 28 (approximately)
markus.kienast@dal.ca
room 5637, Life Science Center, Oceanography Wing

Office Hours: In-person before and after class, or arrange by email

Attendance

In-person attendance is important, and active student participation in class activities, discussions, and coding workshops is greatly encouraged. The lecture slides are generally posted on-line shortly after class, but keep in mind that these files may not contain everything that was covered (e.g., in-class discussions, notes on the white board). Some classes contain exercises that are useful to complete assignments. It is your responsibility to find out what you missed from classmates and the course website if you are unable to be in class.

Technology Requirements

Brightspace, R (mandatory for assignments), Excel (optional).
Students are required to download the free coding software R Studio. If you have not worked with R Studio before, instructions for downloading can be found in the *Start Here* Section on the course website.

Learning Objectives

- 1) Determine the mass and size of the Earth.
- 2) Infer the internal structure of the Earth.

- 3) Derive the absolute age of the Earth using radioactive isotopes.
- 4) Apply knowledge of plate tectonics to explain the formation of ocean basins and their change through geologic time.
- 5) Calculate, to a good approximation, the isostatic balance between the continents and the sea floor.
- 6) Distinguish the sources of sediment accumulating on the modern sea floor.
- 7) Explain the distribution of sediments and link it to large-scale oceanographic and geologic processes.
- 8) Quantify sedimentation rates and accumulation rates on the sea floor with information from radioactive isotopes and other evidence.
- 9) Increase proficiency in coding with R.
- 10) Communicate scientifically on a course-related topic of your choice (grad students)

Assessments	undergraduate (%)	graduate (%)	due date
Assignments (4 to 6)	40	20	
Mid-Term	20	20	Feb 26
Presentations	-	30	Apr 02, Apr 04
Final	40	30	exam period (Apr 9-26)

Assignments (4-6)

The purpose of the assignments is to reinforce the scientific concepts learned in class and to practice coding in R. Assignments will be introduced in class and due dates will be communicated clearly in class and on Brightspace. You will typically have 5-7 days to complete an assignment. Assignments include coding, calculations, and scientific reasoning (i.e., writing), both of which need to be completed satisfactorily to receive a passing grade.

Note that some assignments may be in two parts. The first part must be completed by all students; the second part must be completed by the graduate students only.

If you are confused by an assignment, the instructors will give guidance. It is recommended that you look at the assignments soon after getting them, so that you have enough time to solve them and to get assistance if needed. Questions asked 24 hours before the due date may not get an answer.

Pay attention to specific submission instructions for each assignment during the term. Some assignments are submitted on the course website, some on paper during class time.

Mid-Term Exam

The mid-term is scheduled on Wednesday, February 26 during regular class time and will be in-person. The emphasis will be on geologic concepts, not coding. This is week after the reading break, so you likely have mid-terms and deadlines in other classes as well. Plan ahead.

Graduate Student Presentations

Graduate students choose a topic in consultation with the instructors by February 28 the latest and prepare a presentation (ca 20 min) for the class. Presentation days are Wednesday, April 2 and Friday, April 4. Attendance by all is expected.

Final Exam

The final exam will be in person during the official exam period between April 9-26. Do not make travel plans until the exam schedule is posted by the registrar's office early in February. The emphasis will be geologic concepts (not coding). While the final exam covers material from the entire term, there is a stronger focus on the second half.

Course Policies

Prerequisites: If you got a pre-requisite override to register in OCEA 4110/5110 or EARTH 4110, you are still expected to apply concepts and skills learned in the prerequisite courses. It is your responsibility to recognize and, if needed, address, any gaps related to missing prerequisites.

General Rules for Assignments and Tests:

Clearly show all steps in your calculations and include units. Make sure all figures are complete and have proper axis labels. For coding assignments, insert useful comments and line breaks in your codes before submission. For written answers, make clear arguments and include the underlying geological evidence that supports your argument. Cite your sources (any style) if you use materials that were not on the course website.

Academic Integrity

Academic integrity is seen as a foundation of all Universities and Research Institutions in the world. This means we are all guided in our work by honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. In practical terms, this means that while students are allowed to discuss their coding assignments with each other, **each student must pass in their own assignment, reflecting their own work, speaking in their own voice (written answers)**. Copying the code from others to succeed in the assignments will not help you in the mid-term and final exam. Similarly, cheating and plagiarism will not be tolerated during the exams.

Grade Items

All individual course components must be completed and receive a passing grade to pass the course.

Late work

Assignments: 10% off for each day late (24 hours). Late submissions will be accepted until the marking process is completed, which generally takes 7-10 days. After that, late submissions will no longer be accepted and result in 0%. Students have one "Get out of jail free card", meaning one late submission goes without penalty for the first 72 hours, no explanations necessary. If you wish to use the card with a given submission, you must indicate this on Brightspace when uploading your assignment (for electronic submissions) or on your paper (when handing in a hard copy). Use your card wisely.

Mid-term: Students missing the scheduled mid-term (Feb 26) will write a make up soon after.

Final exam: Students missing the final exam will receive an "incomplete" grade until arrangements can be made for a make-up.

SDA: Student Declaration of Absence forms are not used in this class.

Extenuating Circumstances

If you are ill for an extended period, or find yourself in extenuating circumstances beyond your control, please contact the Assistant Dean of Student Affairs at Scieasst@Dal.Ca.

Grade conversion

Numerical results will be converted to letter grades according to the Dalhousie Common Grade Scale:

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

For undergraduate students, a letter grade of D is a passing grade. For graduate students, a letter grade of B- is a passing grade.

Definition of Letter grades

Excellent: A+, A, A-

Considerable evidence of original thinking; demonstrated outstanding capacity to analyze and synthesize; outstanding grasp of subject matter; evidence of extensive knowledge base.

Good: B+, B, B-

Evidence of grasp of subject matter, some evidence of critical capacity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.

Satisfactory: C+, C, C-

Evidence of some understanding of the subject matter; ability to develop solutions to simple problems; benefitting from his/her university experience.

Marginal Pass: D

Evidence of minimally acceptable familiarity with subject matter, critical and analytical skills (except in programs where a minimum grade of 'C' is required).

Faculty of Science Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates):

http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol:

https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies:

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803:

<https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>